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Procedia - Social and Behavioral Sciences 213 (2015) 5 – 11

Procedia
Social and Behavioral Sciences

20th International Scientific Conference Economics and Management - 2015 (ICEM-2015)

Does the Survey Data on New Orders Lie?

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Abstract

The data of business and consumer surveys are often used for the prediction of the future changes of economics. But doubts that survey data are suitable for such prediction also exist. The objective of this research is to test how the survey data on new orders corresponds to the real data of industrial new orders. An incentive to make such the research arises after the decision of European Commission to stop the collection of data on industrial new orders. The research showed that the survey data on new orders weakly represents the real data of new orders. Moreover, the survey data on new orders is not an appropriate measure for prediction of the future industrial production. It means that lots of managers participate in the survey irresponsible and don't show the real situation or the questions that they must answer are not very clear for them.

Peer-review under responsibility of Kaunas University of Technology, School of Economics and Business

Keywords: Industrial new orders; Survey data on new orders; Industrial production; Confidence of surveys; Germany.

Introduction

Many researchers agree that the business and consumer surveys are very important for the prediction of the future changes of economics. In other words they are the leading indicators of an economic activity. But group of researches leaves doubts that survey data are suitable for such prediction. The problem is that this question is still under discussion. The objective of this research is to test how the survey data on new orders corresponds to the real data of industrial new orders.

An incentive to make such the research arises after the decision of European Commission to stop the collection of data on industrial new orders. That's why the data on new orders are published in Eurostat's database until April 2012. This decision is based on their research. European Commission (2011) concludes that the industry survey data

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Peer-review under responsibility of Kaunas University of Technology, School of Economics and Business
doi:10.1016/j.sbspro.2015.11.395

on orders contain the relevant information to assess the new orders, and that a model-based proxy - based on the survey data and the industrial turnover - could be built to fill in the gap left by the probable forthcoming discontinuation of the new orders index. The European Statistical System Committee agreed that the data collection of the industrial new orders variables should be stopped in the context of prioritisation in the development and production of statistics in the light of reduced resources and with the objective of reducing the burden on the European Statistical System.

The results of the research of European Commission showed that the balance series on developments of the orders observed over the past 3 months is highly correlated with the y-o-y changes in new orders (correlation coefficient = 0.94), but the correlation with q-o-q changes in new orders is weaker (equal to 0.5). At the country level, high correlation (i.e. greater than 0.75) between the survey series and the new orders index can be found for most of the larger Member States. But also the European Commission indicates that the regression results confirm that the survey series fit the new orders real data rather well, although the goodness of fit is not fully satisfactory. In particular the degree of residuals' autocorrelation is rather high. Finally, the survey series does not have any leading properties with respect to Eurostat's new orders index (but it does not seem to lag it either).

That's why the results of the research of European Commission raises doubts that survey data on new orders can be used for prediction of real industrial new orders and industrial production as well. So the authors of this research have set the tasks to test: 1) can the industrial new orders be predicted by the survey data on new orders and 2) can the survey data on new orders be the measure for prediction of the future industrial production.

1. The former researches based on industrial new orders, survey data and industrial production

The business tendency surveys are also known as the economic opinion surveys or business climate surveys. Generally they focused on the conclusions about the economic activity, based on the results of business leaders' forecasts concerning their current positions on the market, plans and expectations in the nearest future. The business tendency surveys are carried out to obtain the qualitative information for use in monitoring the current business situation and forecasting the short-term developments.

The basic purpose of business tendency surveys in the past was to collect information on business conditions for the benefit of respondents and as a result many such surveys are carried out by trade associations. Today, business tendency surveys have become a valuable tool for economic analysis for all types of users because the survey information focuses on assessments and expectations of the economic situation by actors in the market (Nilsson, 2001; OECD, 2003). Results from business tendency surveys are often used to construct leading indicators, such as GDP (Abberger, 2007b; Hansson et.al., 2005), prediction of employment (Siliverstovs, 2013; Abberger, 2007a), private investments (Roman et.al., 2013; Abberger, 2005) and other purposes.

The Eurostat industrial new orders index measures the value of new contracts for goods produced by the manufacturing sector. Eurostat aggregates country data and provides a breakdown of orders by manufacturing sector. The industrial new orders index could be a good coincident indicator of industrial production and can help in forecasting GDP changes. A rising level of industrial new orders usually forecasts increasing production, increasing economic growth and rising GDP.

The significance of prediction of industrial new orders stems from their empirically upheld tendency to historically anticipate (turning points in) the business cycles (Bondt et.al., 2013). There is a long-standing tradition of the new orders leading industrial production (Alexander & Stekler, 1959). More recent evidence supporting the leading properties of new orders is provided by Döpke, Krämer and Langfeldt (1994) for Germany and by García-Ferrer and Bujosa-Brun (2000) for France and Spain. Furthermore, the new orders in manufacturing have historically exhibited high correlation with the cyclical components of the business cycle in the U.S. (Stock & Watson, 1999). Consistently, manufacturing new orders in capital goods have served as inputs to the Conference Board's Leading Economic Index for both the U.S. and the euro area. New orders are also among the leading series used for the widely monitored OECD's composite leading indicator (Bondt et.al., 2013; Gabe et al, 2014).

Only a few studies focusing on modelling industrial new orders exist. More recent research concludes that business tendency surveys are able to predict the Italian business cycle, and are therefore useful for forecasting the Italian real economy in the short run (Cesaroni, 2011). Etter and Graff (2003) modeled the new orders for Switzerland using the business surveys. They found that the OLS-generated estimates predict levels, turning points,

peaks and troughs of their reference series very closely throughout the whole estimation period.

The business and consumer surveys have become an essential tool for gathering information about the different economic variables. While the fast availability of the results and the wide range of variables covered have made them very useful for monitoring the current state of the economy, there is no consensus on their usefulness for forecasting macroeconomic developments.

The results obtained by the research of Claveria and others (2007) extend the results of previous research that has included information from business and consumer surveys to explain the behaviour of macroeconomic variables, but are not conclusive about its role. Lui and others (2011) indicate that survey has little role to play in enhancing our knowledge of what has recently happened to manufacturing output.

Dapkus and Pridotkiene (2014) stated that companies can lie about their economic situation in public surveys. The results of the research of Dapkus and Maksvytiene (2012) on the basis of Germany's data demonstrate that there is a strong probability to be a lying symptom in producer's behaviour especially in the moments of possible activity recession. The analysed issue leave the space for scientific discussion about the use of surveys data for economic forecasting. The question how could we improve forecasting methods taking into account the possibility of intentional lying in surveys responses remains open.

Berttrand and Mullainathan (2001) declared that a set of experiments has shown that simple manipulations can affect how people process and interpret questions, for example the ordering of questions, question wording and so on. An even more fundamental problem is that respondents may make little mental effort in answering the question, such as by not attempting to recall all the relevant information or by not reading through the whole list of alternative responses.

Beyond purely cognitive issues, the social nature of the survey procedure also appears to play a large role in shaping answers to subjective questioning. Respondents want to avoid looking bad in front of the interviewer. Part of the problem comes from respondents' reluctance to admit lack of an attitude. More profound problem is that people may often be wrong about their "attitudes". People may not really be good at forecasting their behavior or understanding why they did what they did. A final and related problem is cognitive dissonance. Subjects may report (and even feel) attitudes that are consistent with their behavior and past attitudes.

As a conclusion Berttrand and Mullainathan (2001) declared that put in an econometric framework, these findings cast serious doubts on attempts to use subjective data as dependent variables, because the measurement error appears to correlate with a large set of characteristics and behaviors. These data may be useful as explanatory variables, but one must take care in interpreting the results since the findings may not be causal.

2. Relationship between the industrial new orders, survey data and industrial production: Germany case

According to the importance of such economic indicators as industrial new orders, survey data and industrial production, the authors of this research set the objective to test the relationship between them for Germany data. This country was chosen for this research because it is one of the leading economies in Europe and because of the longest series of statistical information. Monthly survey data on new orders, real industrial new orders and industrial production from January 1995 till April 2012 were analyzed. The tendency of these ratios during the period 1995-2012 is shown on Fig. 1.

The preliminary analysis of this graph let say that there is not significant relationship between these three ratios, but the more detailed analysis should be done. So further three questions will be analysed:

- Does the survey data on new orders reflect the real industrial new orders?
- Are the survey data on new orders based on the real orders in the current and/or the previous periods?
- Are the survey data on new orders or the real industrial new orders the better measure for prediction of the future industrial production?

Before that it is useful to analyse the content of the surveys. Managers are asked two different types of the questions on orders (European Commission, 2013):

- Do you consider your current overall order books to be: more than sufficient (above normal) /sufficient (normal) /less than sufficient (below normal)? It is managers' assessment of the current level of order books surveyed on a monthly basis.
- How have your orders developed over the past 3 months? Increased /unchanged/ decreased. It means that past developments in orders are surveyed on a quarterly basis.

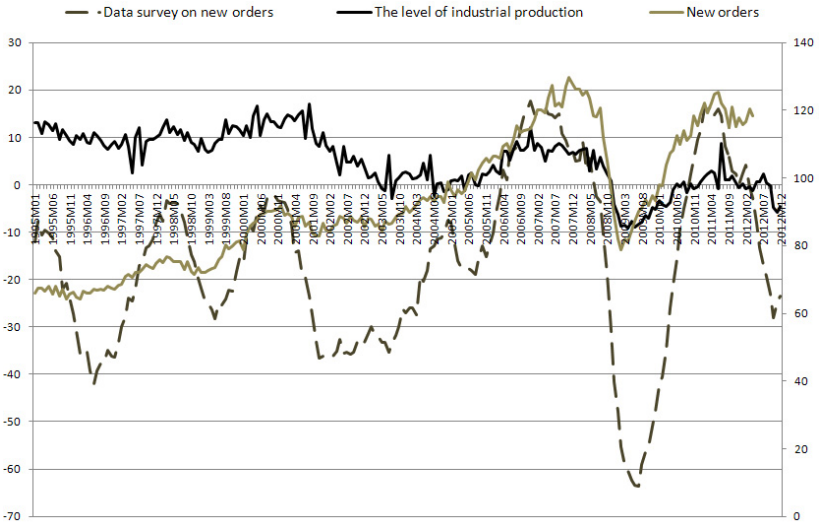

Fig. 1. The tendency of Germany survey data on new orders, real industrial new orders and industrial production during the period 1995-2012
Source: made by authors according to the data of Eurostat

According to these questions the answers of managers must show the current level of real industrial new orders. It means that the survey data on new orders must reflect the real industrial new orders and the answer in to the first question (Do the survey data on new orders reflect the real industrial new orders?) must be positive, i.e. the survey data on new orders reflect the real industrial new orders. Moreover if managers are answering into the questions fairly, the survey data on new orders can be accurately predicted by the real industrial new orders. It will be checked by the second question (Are the surveys data on new orders based on the real orders in the current and/or the previous periods?).

2.1. Do the survey data on new orders reflect the real industrial new orders?

In order to test whether survey data on new orders reflect the real industrial new orders the correlation analysis and the regression model will be made. Primarily the stationarity of each indicator was tested in order to avoid the spurious regression. Unit root test showed that survey data on new orders are stationary (without trend and intercept), but the real industrial new orders is first-order integrated process (without trend and intercept) when the significant level is 0.05. That's why the first-order differences of the real industrial new orders were calculated and used for the further analysis.

In order to test whether the changes in survey data on new orders are related with the changes in real industrial new orders, the first-order differences of the survey data on new orders were also calculated and used for the further analysis.

Correlation coefficient between the changes in survey data on new orders and the changes in real industrial new orders is equal to 0.40 So linear correlation is not strong, but significant. The simple linear regression model is written below:

$$\Delta new\_orders_t = 0.238704 + 0.321325 \cdot \Delta survey\_data_t . \quad (1)$$

This model is significant as parameters are significant and the probability of Fisher criterion is equal to 0, but the coefficient of determination is only 0.16 and residuals of the model are correlated and heteroscedastic. It means that this regression model cannot be used for prediction of new orders and the survey data on new orders doesn't reflect the real industrial new orders properly.

2.2. Are the survey data on new orders based on the real orders in the current and/or the previous periods?

In order to evaluate whether the survey data on new orders are based on the real orders in the current and/or the previous periods the regression model with lag independent variable will be created. As the significant lag time period is not known, rather long delay, i.e. 24 months was chosen. Stepwise forward and stepwise backwards procedures were chosen to evaluate the significant lagged periods. The probabilities of 0.05 were chosen as stopping criterion. Both procedures give the similar results:

$$\begin{aligned}\Delta survey\_data_t = {} & 0.338518 \cdot \Delta new\_orders_t + 0.476580 \cdot \Delta new\_orders_{t-1} + 0.286936 \cdot \Delta new\_orders_{t-2} + \\ & + 0.268546 \cdot \Delta new\_orders_{t-9} - 0.226706 \cdot \Delta new\_orders_{t-11} - 0.263788 \cdot \Delta new\_orders_{t-19} - \\ & - 0.197692 \cdot \Delta new\_orders_{t-20}.\end{aligned} \quad (2)$$

It shows that the changes in survey data on new orders depend not only on the changes of real industrial new orders during the last three months but also the orders before 9, 11, 19 and 20 months are evaluated. The adjusted coefficient of determination of this model is 0.566 and the residuals of it satisfy the needed requirement:

- The mean of residuals is equal to 0.
- The residuals are distributed by normal distribution. The Jargue-Bera criterion is equal to 0.76 and its probability is 0.68.
- The residuals are homoscedastic. nR2 statistics by Breusch-Pagan_Godfrey test is 13.47 and the probability of $\chi 2(7)$ is equal to 0.06.
- The correlogram shows that the residuals are not correlated.

It means that this model is suitable for prediction. The regressors selection summary in stepwise forward procedure shows that the changes of real industrial new orders in the time moments t, t-1 and t-2 are the most important. If only these three periods are taking into account the adjusted coefficient of determination is equal to 0.447.

As the model explains only about 50% of the variation in survey data on new orders the survey data cannot be called as an accurate measure that show the real industrial new orders. It means that there are a lot of managers that participate in the survey irresponsible and don't show the real situation. That's why the survey data on new orders are lying and can't be used for the prediction of real situation.

2.3. Are the survey data on new orders or the real industrial new orders the better measure for prediction of the future industrial production?

The industrial new orders are often used as the leading indicator for the prediction of industrial production. As the publication of real industrial new orders has stopped, then the question arises: are the survey data on new orders suitable for the prediction of industrial production?

The industrial production is the first-order integrated process (without trend and intercept) when the significant level is 0.05, that's why the first-order differences were calculated and used for the further analysis.

As the time period when the new order becomes the production is not known, rather long delay, i.e. 24 months was chosen. Stepwise forward and stepwise backwards procedures were chosen to evaluate the significant lagged periods. The results got by stepwise forward procedure are presented below:

$$\Delta production_t = 0.310034 \cdot \Delta survey\_data_{t-1} - 0.361895 \cdot \Delta survey\_data_{t-4} + 0.275255 \cdot \Delta survey\_data_{t-5}. \quad (3)$$

This model is not suitable for prediction as the adjusted coefficient of determination is equal to 0.11, the residuals are correlated and not distributed by the normal distribution. Stepwise backwards procedure also did not let to improve the results.

Unfortunately similar results were got trying to create the model between industrial production and real industrial new orders taking into account their lag values. The adjusted coefficient of determination is equal to 0.10 and the residuals of the model do not satisfy the requirements.

Conclusions

The analysis of relationship between survey data on new orders, real industrial new orders and industrial production showed that the survey data on new orders doesn't reflect the real industrial new orders. It can be because the survey data are lying. The research showed that the regression model between the survey data on new orders and the real industrial new orders taking into account their lag values explains only about 50% of the variation. It means that lots of managers participate in the survey irresponsible and don't show the real situation or the questions that they must answer are not very clear for them. That's why the survey data on new orders cannot be used for the prediction of real industrial new orders, industrial production or other economic indicator as they are unreliable.

References

Abberger, K. (2005). The Use of Qualitative Business Tendency Surveys for Forecasting Business Investment in Germany. *Ifo Working Paper No. 13.*

Abberger, K. (2007). Qualitative business surveys and the assessment of employment – a case study for Germany. *International Journal of Forecasting 23,* 249-258.

Abberger, K. (2007). Forecasting Quarter-on-Quarter Changes of German GDP with Monthly Business Tendency Survey Results. *Ifo Institute for Economic Research at the University of Munich. Ifo Working Paper No. 40.*

Alexander, S. S., & Stekler, H. O. (1959). Forecasting Industrial Production – Leading Series versus Autoregression. *Journal of Political Economy*, *67*, 402-409.

Berttrand, M., & Mullainathan, S. (2001). Do People Mean What They Say? Implications for Subjective Survey Data. *American Economic Review, 91.* DOI: 10.1257/aer.91.2.67.

Bondt, G.J., Dieden, H. C., Muzikarova, S., & Vincze, I. (2013). Introducing the ECB indicator on euro area industrial new orders. *European Central Bank, Occasional paper series, no 149 / June 2013.*

Cesaroni, T. (2011). The Cyclical Behavior of the Italian Business Survey Data. *Empirical Economics*, 41, 747-68.

Claveria, O., Pons, E., & Ramos, R. (2007). Business and consumer expectations and macroeconomic forecasts. *International Journal of Forecasting 23,* 47-69.

Dapkus, M., & Maksvytienė, I. (2012). Makroekonominio melo identifikavimas. *Economics and management. 17.*

Dapkus, M., & Pridotkiene, J. (2014). Testing of Macroeconomic Lying Hypothesis: French Industry Case. *Procedia - Social and Behavioral Sciences, 156*, 286-291.

Döpke, J., Krämer, J. W., & Langfeldt, E. (1994). Konjunkturelle Fruhindikatoren in Deutschland. (Leading Indicators for the Business Cycle in Germany. With English summary.)", *Konjunkturpolitik*, *40,* 135-53.

Etter, R., & Graff, M. (2003). Estimating and Forecasting Production and Orders in Manufacturing Industry from Business Survey Data: Evidence from Switzerland, 1990-2003. *Swiss Journal of Economics and Statistics*, *139 (4)*, 507-33.

European Commission (2011). Highlight: the relevance of BCS data for assessing new orders in Manufacturing. *European Business Cycle Indicators Report,* 14-18. Available at: http://ec.europa.eu/economy_finance/publications/cycle_indicators/2011/pdf/4_en.pdf.

Gabe, J.B., Heinz, C. D., Sona, M., & Istvan, V. (2014). Modelling industrial new orders using surveys. *Economic Modelling, 41,* 46-54.

García-Ferrer, A., & Bujosa-Brun, M. (2000). Forecasting OECD industrial turning points using unobserved components models with business survey data. *International Journal of Forecasting*, *16,* 207–227.

Hansson, J., Jansson, P., & Löf, M. (2005). Business survey data: Do they help in forecasting GDP growth? *International Journal of Forecasting 21,* 377-389.

Lui, S., Mitchell J., & Weale, M. (2011). Qualitative business surveys: signal or noise? *Journal of the Royal Statistical Society: Series A, 174,* 327-348.

Nilsson, R. (2001). Business tendency surveys: methodology, analytical use and presentation of results. *OECD statistics.* Available at: http://stats.oecd.org/mei/default.asp?e

Organisation for Economic Co-operation and Development (2003). Business Tendency Surveys: A Handbook.

Roman, P.A., & Vasquez, D.M. (2013). Are business tendency surveys useful to forecast private investment in Peru? A non-linear approach. *Banco Central de Reserva del Peru*.

Siliverstovs, B. (2013). Do business tendency surveys help in forecasting employment? A real-time evidence for Switzerland. *Journal of Business*

Cycle Measurement and Analysis. No.: 10(2), 129-151. Doi: 10.1787/jbcma-2013-5k4bxlxjkd32.

Stock, J. H., & Watson, M. W. (1999). Business Cycle Fluctuations in US Macroeconomic Time Series. Handbook of Macroeconomics, 1. Taylor and M. Woodford. Elsevier Science B.V., 15-33.